INPRO Dialogue Forum "Drivers and Impediments for Regional Cooperation on the way to Sustainable Nuclear Energy Systems"30th July – 3rd Aug 2012, VIC

Presentation from Uganda

By

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Outline

- Status and prospects
- Driving forces and impediments for embarking upon NPP
- Prospective Nuclear Energy Systems
- Country's role in deploying NPP
- Vision of back-end fuel cycle
- Concept of sustainable NES
- Vision of energy independence and security of supply
- Experience and plan for cooperation
- Drivers and impediments for cooperation
- Indicators
- Conclusions

Country Profile

Location: East Africa

Total Area: 241,038 km^2

Area covered by water: 36,330 km^2

Capital: Kampala

Population: 32.9 million

Total Installed Capacity: 771 MW

Electricity consumption: 75 kwh/capita (2010)

Policy, legal and institution framework

- The desire to include nuclear energy in Uganda's energy mix is briefly documented in the Energy Policy for Uganda, 2002 and the National Development Plan (NDP) 2010/11 – 2014/205
- The Energy Policy recognised the need to:
  - establish a regulatory framework;
  - draw up medium and long term national plans on nuclear energy applications.

Policy, legal and institution framework cont'd

- The NDP recognised the need to carry out training in the short term to assess viability of nuclear power programme in Uganda

- In line with the Energy policy for Uganda, a number of legislations were introduced:
- Atomic Energy Act, 2008 repealed the Atomic Energy Decree of 1972.

Policy, legal and institution framework cont'd

- The Atomic Energy Act, 2008 provided for:
  - strengthening the regulatory framework;
  - a framework for promotion and development of nuclear energy for electricity generation.
- The Act also established:
  - Atomic Energy Council (AEC) as a national regulatory body of atomic energy matters
  - Nuclear Energy Unit (NEU) in Ministry of Energy and Mineral Development to promote and develop the use of nuclear energy for power generation

Key functions of the Nuclear Energy Unit

- To develop a comprehensive national strategy to assess the potential role, viability and obligations associated with nuclear energy in the context of energy needs for national socio-economic development
- To prepare a long term sustainable programme for supply of nuclear fuel
- To prepare a plan for management, interim storage and final disposal of radioactive waste
- To coordinate TC programme

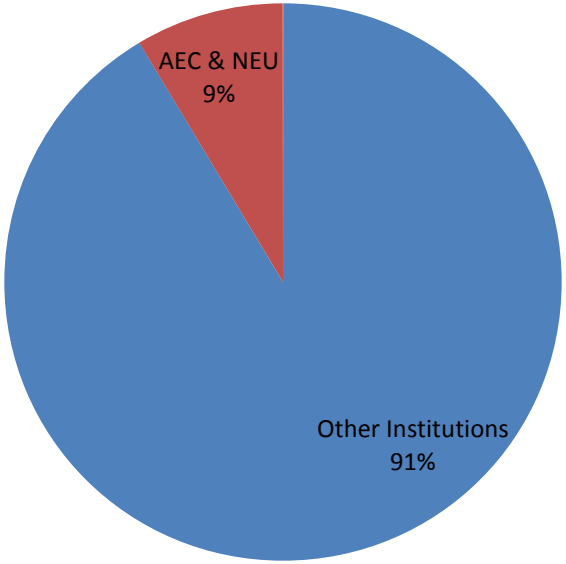
Other key institutions

- Electricity Regulatory Authority (ERA) established by the Electricity Act, 1999 to regulate generation, transmission, distribution, sale, import, export of electricity in Uganda
- Uganda Electricity Transmission Company Limited (UETCL)
- Generation and distribution companies, both private and public
- Electricity Disputes Tribunal (EDT)

Other key institutions

- National Environmental Management Authority (NEMA) established by the National Environmental Act, 1998 to coordinate, monitor and supervise all activities that impacts on the environment

Human Resources



International and regional cooperation

Current participation include:

- IAEA Activities through the TC programme
- International Framework on Nuclear Energy Cooperation (IFNEC) as an observer
- African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA)
- Forum for Nuclear Regulatory Bodies in Africa (FNRBA)

Existing Power Plants

Site	Type	Installed Capacity (MW)	Status
Nalubaale	Hydro	180	Operational
Kiira	Hydro	200	Operational
Bujagali	Hydro	250	Operational
Namanve	HFO	50	Operational
Tororo	HFO	20	operational
Kakira & Kinyara	Cogeneration	17	operational
Various	Mini-hydro	54	operational
Total		**771**	

Other power projects

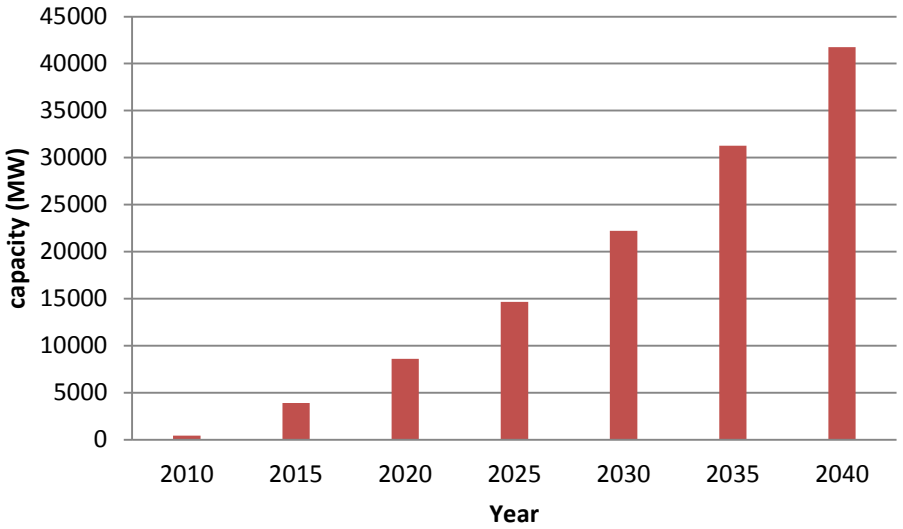
Site	Type	Installed Capacity (MW)	Status
Karuma	Hydro	600	planned
Ayago	Hydro	600	planned
Isimba	Hydro	140	planned
Tororo	HFO	230	planned
Oriango	Hydro	400	planned
Hoima	HFO	700	planned
Kabaale	Peat	40	planned
Various	Hydro	150	planned
Various	Geothermal	100	planned
Various	Co-generation	150	planned
Total		**3110**	

Source: NDP 2010/11 – 2014/15

Driving force for embarking upon nuclear power programme

- Generation potential from Hydro, Biomass, Geothermal and peat will not be able to meet NDP targets. Target consumption per capita in 2040 is 3,668 kwh/capita

Energy Source	Estimated Potential (MW)
Hydro	4,500
Biomass	1650
Geothermal	450
Peat	800
Total	**7,400**



Source: NDP 2010/2011 – 2014/2015

Driving force for embarking upon nuclear power programme cont´d

- Central location of the Country in the regional thus easy to share the infrastructure
- Regional power demand
- Drought in the East Africa region making hydro power generation unreliable

Impediments

- Weak government policy; No clear government position on nuclear energy projects
- Lack of human resources
- Small electric grid to accommodate proven reactor technology on market
- Limited funding
- Nuclear Phobia

Prospective Nuclear Energy Systems

- No assessment has been done to establish suitable NES
- Most probable NES will be NPP for electricity generation.
- This will be selected from available proven reactor technology depending on their:
  - Safety
  - Economics
  - Environmental impact
  - Efficiency
  - Waste generation
  - Proliferation resistance

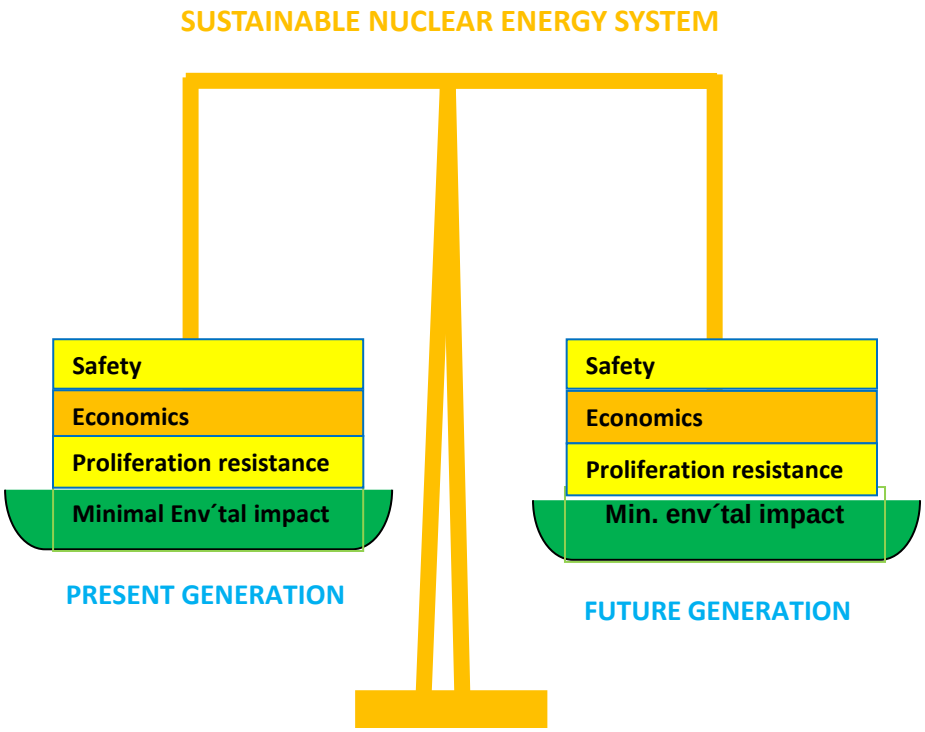
Country's role in deploying nuclear power plants by foreign suppliers

- Policy and legal formulation and monitoring
- Security of nuclear installations
- Institutions development
- Grid expansion and improvement
- Establishment of training facilities
- Basic infrastructure such as roads and rail
- Provision of construction materials

Vision of back-end fuel cycle services for national nuclear power programme

- Currently there is no strategy on spent nuclear fuel and radioactive management
- Existing regulations on spent radiation sources requires repatriation of spent source to supplier Country
- Its most likely that spent nuclear fuel will be shipped back to vendor Country

The concept of a sustainable nuclear energy system



The vision of energy independence and security of supply

To achieve energy independence and security of supply gov´t plans to

- develop existing renewable energy sources such as hydro, solar and bioenergy;
- Strengthen the energy efficiency programme;
- Extend electric grid to rural area through rural electrification programmes and participate in regional power trade projects;
- Develop oil and gas resources of Uganda.
- Construct of Uganda – Kenya pipeline.

Experience of, and plans for, cooperation with other countries in energy projects.

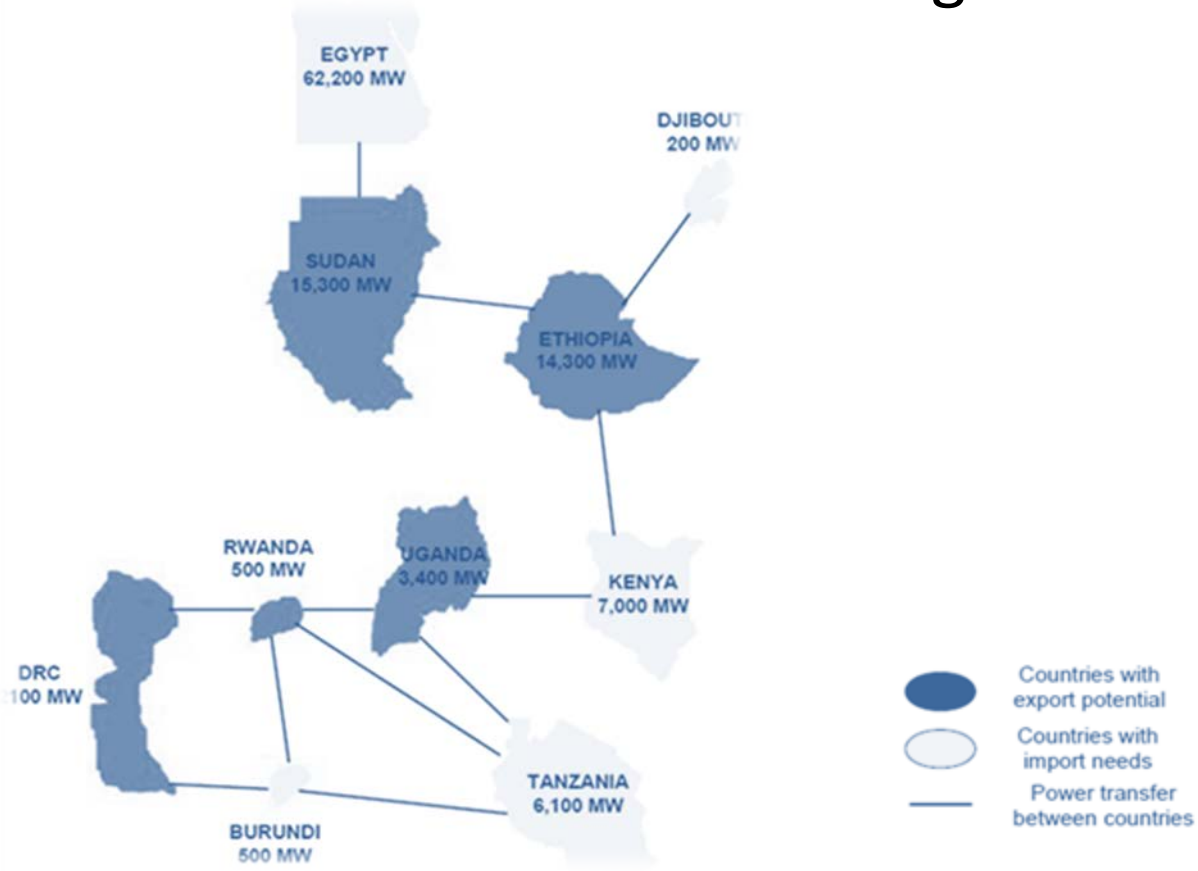
1. Infrastructure development:

Regional Power Trade Projects			
Interconnection		completion	Funder
1. Uganda (Bujagali) - Kenya (Lessos)	220 KV, 256km	2014	AfDB
2. Uganda (Mbarara)-Mirama- Rwanda (Shango)	220 KV, 172 km	2014	AfDB/JICA
3. Uganda – DR Congo (Beni - Bunia)	220kV, 70 km	2015	Norwegian Government
4. Uganda – Tanzania (Mwanza)	220 kV , 85 Km	2015	
4. Uganda (Karuma) – S. Sudan (Juba)	400 kV, 190 km	2015	

Source: UETCL Business Statistics, 2010

Experience and plans for cooperation Cont'd

Future Interconnections in the region



Source: Eastern Africa Power Pool, 2011

Experience and plans for cooperation Cont'd

Human resources Development

Training programme	Country
Nuclear Engineering	UK, Republic of Korea
Nuclear Science and Technology	Ghana, Egypt (under AFRA programme) and UK
Nuclear Law and Policy	UK
Radioactive waste management	South Africa under IAEA TC programme

Drivers and impediments for cooperation with other countries in nuclear power projects

Drivers

- Trans-boundary nature of water resources
- Uganda is a land locked Countries
- Development of physical infrastructure
- Regional interest in nuclear power programme
- Integrate lessons learnt from previous operation into a new nuclear power programme
- Power trade

Drivers and impediments for cooperation Cont'd

Impediments

- No clear national policies on nuclear energy in most African countries
- Political instability in the region
- Limited expertize

Indicators to measure benefits and disadvantages of cooperation

- Level of development of enabling policies and legislations
- Number of human resources trained
- Capacity of regulatory body
- Institutions development
- Physical infrastructure
- National economic growth
- Quality of life

Conclusions

- The current electricity generation potential from Hydro , biomass, geothermal and peat, if fully developed, may not be able to meet Uganda's NDP targets beyond 2025.
- Nuclear energy may be a future option for generating low carbon electricity for not only Uganda but the entire African region.
- Comprehensive preparation and planning of a nuclear power programme will require cooperation with other Countries.

Thank You